A REVISION OF THE PLESIOPID FISH GENUS *TRACHINOPS*, WITH THE DESCRIPTION OF A NEW SPECIES FROM WESTERN AUSTRALIA

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ABSTRACT

The Australian marine fish genus *Trachinops*, which contains four species is reviewed. *T. taeniatus* occurs along the central and southern coast of New South Wales. In Victoria and Tasmania it is replaced by *T. caudimaculatus*. *T. noarlungae* is known from the Adelaide region of South Australia to the Houtman Abrolhos Group off southwestern Western Australia. *T. brauni* is described as a new species from 27 specimens collected at Rottnest Island, Western Australia and at the Houtman Abrolhos. It is distinguished from the other members of the genus on the basis of fin ray and gill raker counts and the presence of greatly elongate pelvic fins. The differences in these characters are of sufficient magnitude to justify the placement of *T. brauni* in a separate subgenus, *Paratrachinops* which is described herein.

INTRODUCTION

The genus *Trachinops* Günther contains four species which are confined to southern Australia. They are members of the family Plesiopidae, a group of serranoid fishes containing perhaps less than two dozen species. As Weber and de Beaufort (1929) have pointed out, there are greatly different opinions regarding their systematic position. However, I choose to follow Greenwood, *et al.* (1966) who regard them as a distinct family unit. In Australia the Plesiopidae is represented by *Assessor* Whitley (2 species), *Calloplesiops* Fowler and Bean (1 species), *Paraplesiops* Whitley (3 species), *Plesiops* Cuvier (2-3 species), and *Trachinops* (4 species). All are tropical coral reef forms except *Paraplesiops* and *Trachinops*, which normally dwell on shallow rocky reefs of temperate Australia. They range in size from the diminutive *Assessor* (about 50 mm SL) to the relatively large *Paraplesiops*

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which reaches a maximum of about 40 cm SL. Most of the species are cryptic dwellers of dark caverns and ledges. Indeed, the species of *Plesiops* are seldom encountered unless collected with commercial ichthyocides.

The species of *Trachinops* are somewhat aberrant in this respect, occurring in open water aggregations which may include over 100 individuals. They swim up to several metres off the bottom in search of zooplankton which is the main component of the diet. Their peculiar undulating swimming behaviour is responsible for the common appellation of 'hula fish' among marine aquarists. The depth range is relatively wide encompassing rocky pools along the coast and deeper offshore reefs to at least 35 metres. The two species which occur around the rocky islands off the Perth metropolitan district are most commonly encountered between 10-30 metres.

T. taeniatus Günther is known from central and southern New South Wales. It is apparently replaced in Victoria and Tasmania by *T. caudimaculatus* McCoy, a species whose geographic limits are poorly known. *T. noarlungae* Glover is distributed from the vicinity of Adelaide, South Australia to the Houtman Abrolhos Group off Geraldton, Western Australia. The range of this species overlaps with that of *T. brauni* n.sp. which is known from the vicinity of Perth to the Houtman Abrolhos. At the latter locality the two species have been taken from rich areas of *Acropora* coral which certainly represents an atypical habitat.

The genus *Trachinops* has not been reviewed previously and there are few records of the various species in the literature.

A summary of counts for the dorsal, anal, and pectoral fin rays, gill rakers on the first branchial arch, and tubed lateral-line scales are presented in Tables 1 and 2.

Type specimens of *T. brauni* have been deposited at the Australian Museum, Sydney (AM); British Museum (Natural History), London (BMNH); Muséum National d'Histoire Naturelle, Paris (MNHN); National Museum of Natural History, Washington, D.C. (USNM); Western Australian Museum, Perth (WAM).

TAXONOMY

GENUS *TRACHINOPS* GÜNTHER

Trachinops Günther 1861. Cat. Fish Brit. Mus., vol. 3, p. 366 (type species *Trachinops taeniatus* by monotypy).

Diagnosis

Dorsal rays X to XV (usually XI or XIV),16 to 21; anal rays III,17 to 23; pectoral rays 14 to 18; pelvic rays I,4; branched caudal rays 7 + 8 = 15; anterior lateral-line scales 38 to 90; posterior lateral-line scales 0 to 18; branchiostegal rays 6; gill rakers on first branchial arch 7 to 10 + 16 to 21, total rakers 23 to 31.

Body greatly elongate, the depth 5.3 to 7.1 in standard length; head 3.7 to 4.8 in standard length. Snout 4.7 to 6.7, eye 2.8 to 3.8, bony interorbital 4.1 to 6.1, least depth of caudal peduncle 1.7 to 2.5, length of pectoral fin 1.1 to 1.7, of pelvic fin 0.7 to 2.0, all in the head length; middle caudal rays usually forming elongate filament, 1.7 to 3.4 in standard length.

Colour in alcohol generally tan or light brown, with or without prominent black stripe or band on side or large spot at base of caudal peduncle.

PARATRACHINOPS, new subgenus

The subgenus *Paratrachinops* contains a single species *T. brauni* which is described below. The diagnostic features of this subgenus are presented in the following key.

KEY TO THE SPECIES OF *TRACHINOPS*

1a. Dorsal spines 11 (rarely 10), extremely weak and difficult to distinguish from soft rays; pectoral rays usually 15; gill rakers on first arch 23 to 24; pelvic fins relatively elongate, 0.7 to 1.2 in head length (Western Australia)
... ... *T. (Paratrachinops) brauni* n.sp.

1b. Dorsal spines 14 (rarely 15), relatively pungent and easily distinguished from soft rays; pectoral rays usually 16 to 18; gill rakers on first arch 26 to 31; pelvic fins relatively short, 1.4 to 2.0 in head length (subgenus *Trachinops*)
... ... 2

2a. Black stripe extending along upper side, continuing to tip of middle caudal rays; gill rakers on first arch usually 26 to 28; posterior lateral-line scales usually 0 to 7 (New South Wales)
... ... *T. taeniatus*

2b. Black stripe on upper sides absent; gill rakers on first arch usually 29 to 31; posterior lateral-line scales usually 12 to 18
... ... 3

3a. Black spot covering most of caudal fin base; soft dorsal rays usually 16 to 17; soft anal rays usually 17 to 19; anterior lateral-line scales usually 45 to 55; eye diameter usually 2.8 to 3.1 in head length (Victoria; Tasmania)
... ... *T. caudimaculatus*

3b. Black spot on caudal base absent; soft dorsal rays usually 20 to 21; soft anal rays 22 or 23; anterior lateral-line scales usually 70 to 90; eye diameter usually 3.2 to 3.5 in head length (South Australia; Western Australia)
... ... *T. noarlungae*

Trachinops brauni, new species

(Figs 1a and 2; Tables 1, 2 and 3)

Trachinops taeniatus (non Günther) Mees, 1962. West. Aust. Fisher. Bull. no. 9 (pt. 3), p. 25.

Holotype

WAM P25545-001, 42.0 mm SL, collected with rotenone off Rottnest Island, Western Australia (approximately 32° 01′S, 115° 26′E) in 3-10 m by G. Allen on 6 March 1975.

Paratypes

AM I.18843-001, 3 specimens, 31.3-43.7 mm SL, collected with rotenone off Armstrong Point, Rottnest Island, Western Australia in rocky pool by zoology students of University of W. Australia on 20 March 1958; BMNH 1976.5.27.1-2, 2 specimens, 40.6 and 48.2 mm SL, same data as preceding types; MNHN 1976.39, 2 specimens, 37.0 and 42.9 mm SL, same data as preceding types; USNM 215917, 3 specimens, 42.5-50.2 mm SL, same data as preceding types; WAM P4894, 4 specimens, 32.0-39.8 mm SL, same data as preceding types; WAM P25164-005, 40.7 mm SL, collected with spear off south side of Rottnest Island, in 3 m by B. Hutchins on 16 February 1975; WAM P25197-004, 2 specimens, 32.3 and 36.0 mm SL, collected with the holotype; WAM P25251-010, 2 specimens, 42.7 and 55.1

mm SL, collected with rotenone off south coast of Rottnest Island in 2-10 m by G. Allen and B. Hutchins on 9 April 1975; WAM P25308-004, 4 specimens, 22.6-26.8 mm SL, collected with rotenone off Seal Island, Wallabi Group, Houtman Abrolhos, Western Australia (approximately 28°31′S, 113°47′E) in 12-16 m by G. Allen on 17 May 1975; WAM P25315-005, 3 specimens, 23.0-30.4 mm SL, collected with rotenone between Seal and Beacon Islands, Wallabi Group, Houtman Abrolhos in 10 m by G. Allen on 20 May 1975.

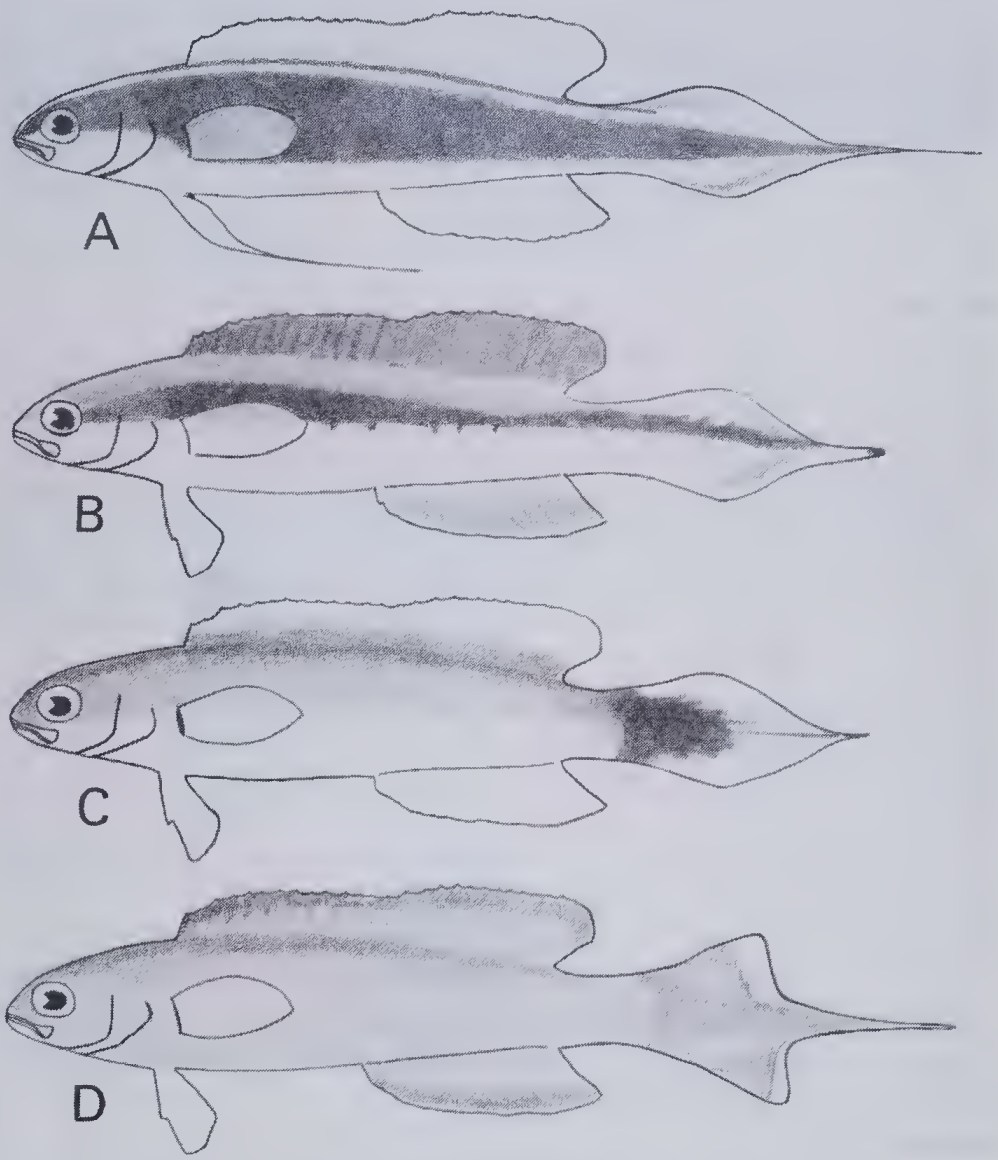

Fig. 1: Comparison of colour patterns for species of *Trachinops*: (a) *brauni;* (b) *taeniatus;* (c) *caudimaculatus;* (d) *noarlungae.*

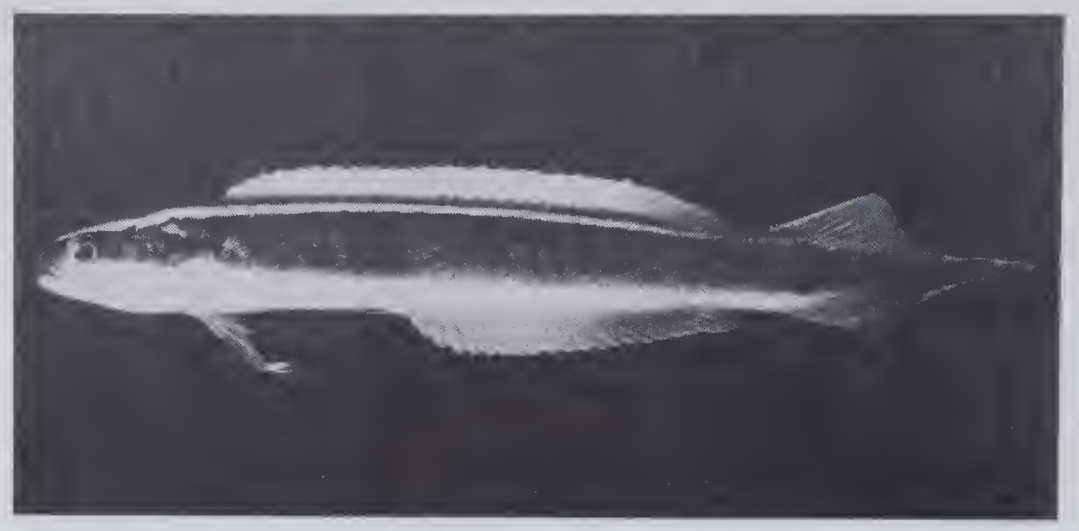

Fig. 2: *Trachinops brauni*, paratype, 42.7 mm SL, Rottnest Island, Western Australia.

Description

Measurements in thousandths of the standard length of the holotype and selected paratypes are presented in Table 3. The range of counts and proportional measurements for the paratypes when differing from the holotype appear in parantheses in the following description.

Dorsal rays XI,20 (X or XI,19 to 21); anal rays III,19 (III,19 to 21); pectoral rays 15 (14 to 15); branched caudal rays 8 + 7 = 15; anterior lateral-line scales 38 to 43; posterior lateral-line scales 3 to 5; branchiostegal rays 6; gill rakers on first branchial arch 7 or 8 + 16 or 17, total rakers 23 or 24.

Body elongate, the depth 6.3 (5.6 to 7.1) in standard length, and compressed, the width 1.8 (1.8 to 1.9) in depth (this measurement taken at level of gill opening); head 4.5 (4.1 to 4.6) in standard length; snout 5.5 (5.5 to 6.3) in head; eye 3.0 (3.0 to 3.5) in head; interorbital space slightly convex, the fleshy width about equal to eye diameter, the bony width 5.2 (5.2 to 5.5) in head; caudal peduncle relatively elongate, the least depth 1.6 (1.5 to 1.8) in its length or 2.2 (2.3 to 2.4) in head.

Maxillary reaching a vertical through posterior edge of pupil; mouth oblique, opening dorsally, the anterior end approximately at level of middle of pupil; upper and lower lips about equal in width which is about equal to half eye diameter, at least anteriorly.

Upper jaw with several enlarged canines anteriorly, grading posteriorly to smaller close-set conical teeth, and an inner band composed of low conical teeth; large triangular patch of retorse teeth on either side of median

symphysis at front of upper jaw, apex of triangle formed by an enlarged retorse canine; lower jaw with 2-3 enlarged canines on each side anteriorly with patch of low conical teeth behind on either side of median symphysis; side of lower jaw, vomer, and palatines with 1-2 rows of low conical teeth.

Opercle and preopercle free of spines, but fleshy rounded projection at angle of opercle; upper end of gill opening about level with imaginary line half way between upper pectoral rays and origin of dorsal fin; anterior and posterior nostrils separated by a distance about equal to 2/3 pupil diameter; anterior nostrils small, about 1/3-1/2 size of posterior nostrils; anterior nostrils with low fleshy rim.

Lateral-line system of body in two sections, the anterior portion originating at upper corner of gill opening, rising obliquely to base of spinous dorsal fin and continuing to below middle portion of soft dorsal fin; posterior section composed of several tubed scales at base of caudal fin; cephalic lateral-line system consisting of pores arranged as follows: dentary-preopercular series with 14 pores, circumorbital-snout series with 14 pores, a single mid-interorbital pore, and temporal-occipital series with about 10 pores.

Scales small, cycloid on head and anterior dorsal portion of body, finely ctenoid elsewhere; predorsal scales extending about to imaginary line connecting preopercle margin of both sides; scales of preopercle and opercle frequently embedded; lower edge of preopercle broadly naked; no scales on interorbital, snout, lips, suborbitals, dentary, and isthmus; no scales on fins except basal portion of caudal.

Origin of dorsal fin slightly behind level of pectoral and pelvic fin bases; dorsal spines slender, flexible, and curved; dorsal spines gradually increasing in height to fifth spine, remaining spines about equal; tallest dorsal spine about 4.2 to 4.5 in head; soft dorsal rays gradually increasing in height to eighth or ninth ray, remaining rays gradually decreasing; tallest soft ray 2.7 to 3.0 in head; origin of anal fin level with first soft dorsal ray; anal spines very weak, scarcely distinguishable from soft rays; first anal spine about 1/2 length of second spine; second spine about 2/3 length of third spine; soft anal rays gradually increasing in height to fifth ray, remaining rays about equal; soft dorsal and anal rays unbranched except last 7-8 rays.

Caudal fin lanceolate with middle rays forming elongate filaments in adults; length of middle rays 2.7 (2.4 to 3.4) in head. Caudal with 17 principal rays, the median 15 branched, the upper and lowermost unbranched; principal caudal rays preceded by 4-5 progressively shorter assessory rays.

Pectoral fins rounded, the longest ray 1.3 (1.5 to 1.7) in head, its tip reaching a vertical at base of fifth dorsal spine; pectoral rays branched except two upper and lowermost rays; origin of pelvic fins slightly ahead of pectoral fins; pelvic fins relatively long and attenuate, their length 0.5 (0.7 to 1.2) in head; the tips in the holotype approaching a vertical at base of seventh or eighth soft anal ray.

Colour in life (from 35 mm Ektachrome slide taken in an aquarium): prominent black band originating at tip of snout, gradually widening and covering most of sides, then continuing through middle of caudal fin; area below this band white; narrow stripe of neon blue running from snout, above eye and along body, just below dorsal fin to base of upper caudal rays; a thin strip of black separating neon blue stripe and dorsal fin; dorsal fin largely pale yellow, dusky on basal 1/4 and pale blue on outer 1/4; anal fin mostly translucent, but slightly dusky on basal 1/2 with yellowish submarginal band and light blue border of equal width on outer 1/2; middle rays of caudal fin black, remainder of fin pale blue except submarginal yellow band on upper lobe and brownish submarginal band grading to yellow anteriorly on lower lobe, edge of caudal fin with fine border of neon blue; pelvic and pectoral fins transparent.

Colour of holotype in alcohol: prominent black band extending from snout to caudal fin; area below band pale tan; brown stripe above band from snout to base of upper caudal rays; fins generally pale except black stripe covering middle caudal rays.

The paratypes which were collected at Rottnest Island in 1958 are much paler than the holotype. The prominent band which is black in the holotype and recently collected paratypes is reddish-brown in the older specimens probably because of their longer exposure to alcohol.

Remarks

Mees (1962) compared 14 specimens of *T. brauni* with the original description of *T. taeniatus* and a single specimen received on loan from the Australian Museum. He erroneously concluded they were identical. He obviously did not have sufficient comparative material and overlooked the discrepancy in dorsal spine counts. However, Mees did comment on the exaggerated pelvic fins of the Western Australian specimens, which have been designated as paratypes in the present study; these are now deposited at AM , BMNH, MNHN, USNM and WAM (P4894).

The species is named *brauni* in honour of Mr John Braun of Perth for his much appreciated assistance in the field.

Trachinops taeniatus

(Fig. 1b; Tables 1 and 2)

Trachinops taeniatus Günther, 1861. Cat. Fish Brit. Mus., vol. 3, p. 366 (type locality, New South Wales).

Diagnosis

Dorsal rays XIV,16 to 17 (rarely 18); anal rays III,19 or 20; pectoral rays 16 to 17; anterior lateral-line scales 51 to 57; posterior lateral-line scales 0 to 7; approximate vertical scale rows from upper corner of gill opening to caudal fin base 60 to 68; gill rakers on first branchial arch 8 to 10 + 17 to 19, total rakers 26 to 28.

Greatest body depth 5.5 to 6.5, head 4.1 to 4.6, middle caudal rays 2.4 to 3.4, all in the standard length. Snout 4.7 to 5.7, eye 3.1 to 3.8, bony interorbital 5.4 to 6.1, least depth of caudal peduncle 2.1 to 2.3, length of pectoral fin 1.3 to 1.6, of pelvic fin 1.6 to 2.0, all in the head length.

Colour when fresh (from 35 mm Kodachrome transparency taken at Sydney Harbour by R.H. Kuiter): colour of head and body reddish-brown on dorsalmost portion, white on ventral half, these two colours separated by broad blackish stripe extending from eye to distal tip of middle caudal rays; dorsal fin charcoal coloured with narrow blue margin; anal fin dusky grading to yellow-white near base; caudal fin bluish-white with prominent black stripe through middle portion (lower border of black stripe yellow); upper and lower lobes of caudal with pair of faint brown submarginal bands; pelvic fins white; pectoral fins translucent.

Colour in alcohol: head and body generally yellowish or pale tan with prominent black stripe on upper side extending from rear part of head to distal tip of middle caudal rays; dorsal fin black with narrow white margin; anal fin dusky with narrow white margin; caudal fin pale with prominent black stripe through middle portion; pelvic and pectoral fins pale.

Material examined

New South Wales — WAM P25530-001, 14 specimens, 26.2-59.7 mm SL, Port Hacking (near Sydney).

The counts and morphometric description given by Günther (1861) are clearly diagnostic and agree well with those of the WAM specimens examined during the present study. The type and two juvenile paratypes are deposited at BMNH (not examined).

Trachinops caudimaculatus

(Fig. 1c; Tables 1 and 2)

Trachinops caudimaculatus McCoy, 1890. Prodromus Zool. Victoria, p.341 (type locality, Williamstown, Hobson's Bay, Victoria).

Diagnosis

Dorsal rays XIV,16 to 17 (rarely XV spines); anal rays III,17 to 19; pectoral rays 18; anterior lateral-line scales 45 to 51; posterior lateral-line scales 13 to 18; approximate vertical scale rows from upper corner of gill opening to caudal fin base 46 to 50; gill rakers on first branchial arch 9 to 10 + 19 to 21, total rakers 29 to 31.

Greatest body depth 5.3 to 6.2, head 3.7 to 4.3, middle caudal rays 2.8 to 3.3, all in the standard length. Snout 4.7 to 5.7, eye 2.8 to 3.2, bony interorbital 4.1 to 4.8, least depth of caudal peduncle 2.1 to 2.5, length of pectoral fin 1.1 to 1.3, of pelvic fin 1.4 to 1.6, all in the head length.

Colour when fresh (from 35 mm Kodachrome transparency taken at Tasmania by D.F. Hoese): upper half of head and body charcoal coloured, lower half tan with slight suffusion of purple; tip of lower jaw dusky; median fins yellowish or pale orange; caudal fin with large black spot at base and middle rays blackish; pelvic and pectoral fins translucent.

Colour in alcohol: similar to fresh coloration except pale portions light tan.

Material examined

Tasmania — AM I.17549-006, 8 specimens, 36.0-57.1 mm SL, Oyster Cove.

The original description by McCoy (1890) is remarkably detailed and accompanied by a superb illustration. The specimens from Tasmania which were examined during the present study are essentially identical to McCoy's Victorian fish. Although the type was not examined it is deposited at the National Museum of Victoria, Melbourne.

Trachinops noarlungae

(Fig. 1d; Tables 1 and 2)

Trachinops noarlungae Glover, 1974. Marine and Freshwater Fishes South Aust. (second ed.), p. 225 (type locality, Port Noarlunga, South Australia).

Diagnosis

Dorsal rays XIV,20 to 21; anal rays III,22 to 23; pectoral rays usually 17 to 18 (rarely 15); anterior lateral-line scales 73 to 90; posterior lateral-line scales 9 to 14; approximate vertical scale rows from upper corner of gill opening to caudal fin base 80 to 85; gill rakers on first branchial arch 9 to 10 + 18 to 21, total rakers 28 to 31.

Greatest body depth 5.0 to 6.1, head 4.4 to 4.8, middle caudal rays 2.2 to 3.1, all in the standard length. Snout 5.7 to 6.7, eye 3.1 to 3.5, bony interorbital 4.4 to 5.2, least depth of caudal peduncle 1.7 to 2.0, length of pectoral fin 1.4 to 1.7, of pelvic fin 1.5 to 1.7, all in the head length.

Colour in life (from 35 mm Ektachrome transparency taken in 8 m off Rottnest Island, Western Australia): head and body generally light grey, paler on ventral half; dorsal portion of head suffused with yellow; median fins generally dusky except caudal suffused with yellow and distal tips of caudal fin rays abruptly blue; pelvic and pectoral fins translucent.

Colour in alcohol: head and body generally tan to median brown grading to dark brown dorsally; dorsal fin light brown with darker submarginal band and narrow whitish border; anal fin slightly dusky with darkish margin; caudal fin generally dusky except tips of upper and lowermost rays abruptly pale; pelvic and pectoral fins pale yellow or tan.

Material examined

Western Australia — WAM P25197-003, 6 specimens, 46.0-59.0 mm SL, Rottnest Island, WAM P25251-015, 65.4 mm SL, Rottnest Island; WAM P.25308-003, 36.4 mm SL, Seal Island, Wallabi Group, Houtman Abrolhos.

The Western Australian specimens which were examined during the present study agree well with Glover's (1974) description, which although brief, is clearly diagnostic and accompanied by an adequate illustration. The holotype and 8 paratypes are deposited at the South Australian Museum, Adelaide (not examined).

Table 1: Fin ray and gill raker counts for species of *Trachinops*

		brauni	*caudimaculatus*	*noarlungae*	*taeniatus*
Dorsal spines	X	2			
	XI	9			
	XII				
	XIII				
	XIV		6	7	8
	XV		2		
Soft dorsal rays	16		3		3
	17		5		4
	18				1
	19	3			
	20	5		3	
	21	3		4	
Soft anal rays	17		1		
	18		4		
	19	3	3		4
	20	4			4
	21	4			
	22			6	
	23			1	
Pectoral rays	14	1			
	15	10	1		
	16				2
	17		4		6
	18		3	7	
Total gill rakers on 1st arch	23	5			
	24	7			
	25				
	26				3
	28			1	5
	29		1	1	
	30		3	2	
	31		3	3	

Table 2: Lateral-line scale counts for species of *Trachinops*

		brauni	*caudimaculatus*	*noarlungae*	*taeniatus*
Anterior lateral-line scales	35-39	3			
	40-44	8			
	45-49		7		
	50-54		1		4
	55-59				4
	60-64				
	65-69				
	70-74			1	
	75-79			3	
	80-84			2	
	90-94			1	6
Posterior lateral-line scales	0				1
	1				
	2				1
	3	2			
	4	5			
	5	4			2
	6				1
	7				3
	8				
	9			1	
	10				
	11				
	12			3	
	13		3	1	
	14			2	
	15		1		
	16		2		
	17		1		
	18		1		

Table 3: Morphometric proportions of selected type specimens of *Trachinops brauni* n.sp.

Character	Holotype WAM P 25545-001	Paratype WAM P25251-010	Paratype USNM 215917	Paratype BMNH 1976.5.27.1-2	Paratype WAM P25197-004	Paratype WAM P4894
Standard length	42.0	55.1	50.2	48.2	36.1	37.5
Greatest body depth	159	158	139	145	180	168
Greatest body width	88	87	80	83	94	91
Head length	224	218	219	220	244	245
Snout length	40	34	38	37	39	40
Eye diameter	74	64	62	62	78	80
Interorbital width	43	40	40	41	47	45
Depth of caudal peduncle	100	91	96	95	102	99
Predorsal length	252	245	243	239	274	259
Preanal length	483	450	490	498	521	552
Dorsal fin base length	595	635	598	602	568	568
Anal fin base length	381	387	382	386	327	365
Pectoral fin length	166	145	143	139	144	147
Pelvic fin length	460	245	299	336	207	333
Length of middle caudal rays	505	421	584	519	416	389

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REFERENCES

GREENWOOD, H.P., ROSEN, D.E., WEITZMAN, S.H. & MYERS, G.S. (1966)—Phyletic studies of teleostean fishes, with a provisional classification of living forms. *Bull. Am. Mus. nat. Hist.* 131: 341-455.

GÜNTHER, A.C. (1861)—*Catalogue of the acanthopterygian fishes in the collection of the British Museum.* 3. London: the Trustees of the British Museum (Natural History).

McCOY, F. (1878-1890)—*Prodromus of the zoology of Victoria.* 2. Melbourne: Govt Printer.

MEES, G.F. (1962)—Additions to the fish fauna of Western Australia. *Fish. Bull. West. Aust.* no. 9(3): 23-30.

SCOTT, T.D., GLOVER, C.J.M. & SOUTHCOTT, R.V. (1974)—*The marine and freshwater fishes of South Australia.* 2nd ed. Adelaide: Govt Printer.

WEBER, M. & de BEAUFORT, L.F. (1929)—*The fishes of the Indo-Australian Archipelago.* 5. Leiden: E.J. Brill.